Spring Dynamometers

IN a former brief communication of mine on the subject of dynamometers (NATURE, vol. xiii. p. 385), suggested by an incidental remark made by Mr. Bottomley, I observed that "about three years ago Prof. Ball when introducing the C. G. S. system of units into the course of mechanics in this College had a series of dynamometers in absolute measure specially constructed for him." In reference to this statement, Dr. Ball's successor in the chair of mechanics, Prof. Hennessy, points out, in a letter to NATURE (vol. xiii., p. 466), that "the system actually employed is not that referred to by your correspondent; I generally employ the kilogram, metre, and second, and sometimes the foot, pound, and second, to measure a dynam or unit of force." It is, however, evident that the few words in my former letter did not question the merits of any particular system of units; whether the use of a mixed system of kilogram-metres and foot-pounds be an improvement upon a system now generally coming into use is a matter of opinion. And though the subject can hardly be one of much interest to your readers, I may, perhaps, remark that so far as my statement concerns Dr. Ball it is perfectly accurate; he was in the habit of using the C. G. S. system in his classes here, and I was unaware any change had been made in this respect, the following statement occurring in Prof. Hennessy's own syllabus for the present as well as last session:—"The unit of force employed is the 'dyne,' or that force which, acting uniformly upon one gramme for one second, will give it a velocity of one centimetre a second." Even if reference had been made to Prof. Hennessy, one would naturally have concluded that the printed syllabus, authorised by the Department, was the one "actually employed."

Passing on to Dr. Ball's dynamometers, Prof. Hennessy remarks that "they cannot be depended upon to results within the tenth of a kilogramme"—finer readings when necessary could, no doubt, be taken by the eye, but that is really only a question for the maker, and the special purpose for which these instruments were designed: then follows the strong assertion that "spring dynamometers are totally unfit for measuring units on the C. G. S. system." As several instruments of precision depending on the tension of a spring recur to one's mind, instruments that only require proper precautions to yield extremely delicate and trustworthy results, it would be interesting to know upon what grounds Prof. Hennessy bases his emphatic and reiterated assertion. If it be merely a question of individual opinion, upon this subject hardly any authorities that could be quoted would carry such weight as Sir W. Thomson and Prof. P. G. Tait, who speak thus in their treatise on "Natural Philosophy," p. 127. "Spring balances we believe to be capable, if carefully constructed, of rivalling the ordinary balance in accuracy, while for some applications they far surpass it in sensibility and convenience."

Royal College of Science, Dublin W. F. BARRETT

The Meteors of April 20th

BETWEEN ten and twelve o'clock on the night of April 18th, Mr. W. L. Taylor, a member of the junior class in the State University, with several other gentlemen, observed an unusual number of shooting-stars. These gentlemen were returning in an open waggon from Ellettsville, eight miles north of Bloomington. No count was kept of the number of meteors observed, but the appearance was so frequent as to attract the attention of all the company. Mr. Taylor thinks the number noticed could not have been less than twelve or fifteen. From the descriptions given of the meteor tracks, I find that they were nearly conformable to the radiant of the Lyraïds. The meteors were remarkably brilliant, apparently equal to stars of the first or second magnitude.

At my request Mr. Benjamin Vail, a student of the University, made observations on the nights of the 19th and 20th of April. Both nights were so cloudy, however, that a continuous watch would have been useless. About eleven o'clock on the night of the 19th, three meteors were seen in the north-west, where the sky at the time was partially clear.

Bloomington, Ind., April 26 DANIEL KIRKWOOD

American Mocking Bird

AN American mocking-bird, about a year old, which I had brought from Tennessee, has, for the past three or four weeks, been affected with an irritation round the eyes, causing the feathers to fall off and the flesh to swell; the bird is otherwise in a healthy condition, but has not sung since it has been affected with the soreness; it has the proper food supplied, and its cage is kept in a clean state; could any correspondent kindly inform me the cause and cure of the disease? M. C.

An Unusual Optical Phenomenon

THIS morning, a little after nine o'clock, the ordinary solar halo, radius about 22°, was seen. It was bright, and the red very distinct.

On turning to the north to find the direction of the cloud drift, a white band was seen extending to the north-east in one direction, and on to the west and south in the other. Its width was about that of the halo near the sun. A pair of compasses and a protractor gave the altitude of this circle about 45°. This being about the sun's altitude, the plane of the circle was no doubt parallel to the horizon and passed through the sun. I believe the circle above described to be but rarely seen.

JOSEPH GLEDHILL

Mr. Crossley's Observatory, Halifax, May 3

OUR ASTRONOMICAL COLUMN

THE BINARY λ OPHIUCHI.—An examination of the recent measures of this star, shows that neither of the orbits computed some 25 or more years since by Mädler and Hind at all represents the later course of the companion, a circumstance mainly attributable, as it appears, to error in one, if not in both, of Sir W. Herschel's measures. Struve at first considered that the angle of 1783 required a correction of 180°, but at a later period he was inclined to apply a similar correction to the angle of 1802, and Dawes also believed it was the latter measure which required alteration, in order to render any orbit possible. It is upon this supposition that the orbits of Mädler and Hind have been calculated: the two sets of elements are subjoined:—

	Mädler.	Hind.
Peri-astron passage	1790·31	1791·21
Period of revolution in years	89·01	95·88
Node	32° 42′	30° 23′
Angle between the lines of nodes and apsides on orbit	126° 4′	135° 24′
Inclination	49° 25′	49° 40′
Excentricity	0·4530	0·4772
Semi-axis major	0″·842	0″·847

Mädler's orbit was published in "Untersuchungen über die Fixsterne-Systeme, Erster Theil." The second orbit was founded upon observations to about the same year, 1849. The projection of the measures since this epoch, however, makes it apparent that the real orbit must be materially different from the above, and the star may be recommended to the attention of those who are interested in the determination of elements of the revolving double-stars.

Sir W. Herschel's papers containing his measures of double stars communicated to the Royal Society, not being always of easy access, the following extracts from his notes on λ Ophiuchi may perhaps prove useful:—

From the *Phil. Trans.*, vol. lxxv., p. 62:—

"I. 83; 1783, March 9. A very beautiful and close double-star, L. w.; S. blue; both fine colours. Considerably or almost very unequal. With 460, $\frac{1}{4}$ or $\frac{1}{3}$ diameter of S.; with 932 full $\frac{1}{3}$ diameter of S. Position 14° 30′ n. following."

From the memoir of 1804—

"May 20, 1802, position was 20° 41′. The position March 9, 1783, was 14° 30′, north following. The difference in nineteen years and seventy-two days is 6° 11′. May 1 and 2, 1802, I could not perceive the small star, though the last of the two evenings was very fine. May 20, 1802, with 527, I saw it very well, but with great difficulty. The object is uncommonly beautiful, but it requires a most excellent telescope to see it well and the focus ought to

be adjusted upon ϵ of the same constellation, so as to make that perfectly round."

These remarks have an essential bearing upon the investigation of elements. The components must have been very close at both Herschel's epochs—if there be no mistake in the register—and this is not at first sight readily explained by the curve exhibiting the motion of the smaller star from Struve's earliest micrometrical measures in 1825 to the present date.

Herschel further remarked in 1802 that the appearance of the components was much like that of "a planet with a large satellite, or small companion," and strongly suggestive of "the idea of a connection between the two bodies, especially as they are much insulated."

THE ROTATION OF VENUS.—In a note upon the time of rotation and position of the axis of Venus, which recently appeared in this column, reference was inadvertently omitted to Flaugergues' observations at Viviers in July, 1796, which, according to a communication from Valz to the *Astronomische Nachrichten* (No. 278, vol. xi), seemed to favour Bianchini's period, and placed the north pole of Venus in longitude 321° 20′, with an elevation of 16° 28′. Details of the observations are wanting, but Valz states that Flaugergues observed with "une ancienne lunette à deux verres de 18 pieds de long, amplifiant 105 fois qu'il dit fort bonne." He also employed one of 14 feet, and a telescope said to be good, which Legentil brought from India. Valz adds: "J'ai vu le dessein original de la tache, elle etait grande et de forme trapezoide arrondie, &c."

Hussey's vigorous but prejudiced defence of the extraordinary period of rotation assigned by Bianchini will be found in *Astronomische Nachrichten*, No 248.

Fritsch, of Quedlinburg, thought some observations of his in April 1801 indicated a period of 23h. 22m. (*Berliner Astronomisches Jahrbuch*, 1804, p. 213).

SONG OF THE SCREW

A MOVING form or rigid mass,
Under whate'er conditions,
Along successive screws must pass
Between each two positions.
It *turns around* and *slides along*—
This is the burden of my song.

The *pitch of screw*, if multiplied
By angle of rotation,
Will give the distance it must glide
In motion of translation.
Infinite pitch means pure translation,
And zero pitch means pure rotation.

Two motions on two given screws,
With amplitudes at pleasure,
Into a third screw-motion fuse;
Whose amplitude we measure
By parallelogram construction
(A very obvious deduction).

Its axis cuts the nodal line
Which to both screws is normal,
And generates a form divine,
Whose name, in language formal,
Is "surface-ruled of third degree."
Cylindroid is the name for me.

Rotation round a given line
Is like a *force* along.
If to say *couple* you incline,
You're clearly in the wrong;—
'Tis obvious, upon reflection,
A line is not a mere direction.

So *couples* with *translations* too
In all respects agree;
And thus there centres in the screw
A wondrous harmony
Of Kinematics and of Statics,—
The sweetest thing in mathematics.

The forces on one given screw,
With motion on a second,
In general some work will do,
Whose magnitude is reckoned
By angle, force, and what we call
The *coefficient virtual.*

Rotation now to force convert,
And force into rotation;
Unchanged the work, we can assert,
In spite of transformation.
And if two screws no work can claim,
Reciprocal will be their name.

Five numbers will a screw define,
A screwing motion, six;
For four will give the axial line,
One more the pitch will fix;
And hence we always can contrive
One screw reciprocal to five.

Screws—two, three, four, or five, combined
(No question here of sex),
Yield other screws which are confined
Within one *screw complex.*
Thus we obtain the clearest notion
Of *freedom* and *constraint* of motion.

In complex III. three several screws
At every point you find,
Or if you one direction choose,
One screw is to your mind;
And complexes of order III.
Their own reciprocals may be.

In IV., wherever you arrive,
You find of screws a cone.
On every line in complex V.
There is precisely one;
At each point of this complex rich,
A plane of screws have given pitch.

But time would fail me to discourse
Of Order and Degree,
Of Impulse, Energy, and Force,
And Reciprocity.
All these and more, for motions small,
Have been discussed by Dr. Ball.

ON THE TELEPHONE, AN INSTRUMENT FOR TRANSMITTING MUSICAL NOTES BY MEANS OF ELECTRICITY

MR. ELISHA GRAY recently read a paper before an American Society explaining his apparatus for transmitting musical notes by electricity. He showed experimentally how, by means of a current of electricity in a single wire, a number of notes could be reproduced simultaneously at a great distance, and how by this means also a number of telegraphic messages could be transmitted at once along a wire and separately received at the other end. One of Mr. Gray's apparatuses was exhibited in London at the last *soirée* of the Society of Telegraph Engineers by the president, Mr. Latimer Clark. The principle of the apparatus is as follows:—

A vibrating reed is caused to interrupt the electric current entering the wire a certain number of times per second and the current so interrupted at the sending end sets a similar reed vibrating at the distant end.